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AUTHOR Rennie, Leonie J.; Treagust, David F.
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ABSTRACT

In 1988, two metropolitan and four country schools (two of which were remote) in Australia received federal grants to implement technology education. This paper presents the outcomes of the six schools' attempts to implement curriculum innovations associated with technology education and interprets those outcomes in the context of a school-based curriculum change within a centralized educational system. Data collection, which was conducted in two stages at the end of the 1989 and 1990 school years, included document analysis, surveys of the technology coordinators, and interviews with coordinators, teachers, and students. Characteristics of the innovations in successful schools included thorough documentation of the implementation plan, allocation of a large proportion of funds to teacher inservice, and designation of a technology coordinator with adequate time for supervision and communication. Findings also indicate that without effective coordination, adequate time, and a high degree of faculty stability, school-based curriculum innovation is unlikely to succeed. One table is included. (Contains 16 references.) (LMI)

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Factors affecting the successful implementation of whole-school curriculum innovations

Léonie J. Rennie and David F. Treagust
Science and Mathematics Education Centre
National Key Centre for School Science and Mathematics
Curtin University of Technology, Perth, Western Australia

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Factors Affecting the Successful Implementation of Whole-School Curriculum Innovations

Abstract

This paper reports the outcomes of six schools' attempts to implement curriculum innovations associated with technology education, and interprets those outcomes in the context of school-based curriculum change within a centralized educational system. Characteristics of the innovations in successful schools were thorough documenting of plans and the intended implementation, allocating a large proportion of funds to the implementation through teacher inservice, and designating a technology coordinator with adequate time to supervize the program and ensure effective communication among faculty about the purpose of the innovation. The findings of the evaluation suggest that without effective coordination, adequate time, and a high degree of faculty stability, school-based curriculum innovation is unlikely to succeed.

Introduction

This paper reports the outcomes of six schools' attempts to implement curriculum innovations associated with technology education, and interprets those outcomes in the context of school-based curriculum change within a centralized educational system. Many countries have centralized education systems, creating the potential for conflicts of interest when schools wish to initiate change in their own curriculum. The school-based curriculum change described in this paper was sanctioned and supported financially by the centralized system. Nevertheless, in some schools, the reasons for success or failure could not be separated from the fact that the schools were part of a centralized system.

In Australia, 70% of high school students are educated in government schools and a Ministry of Education has responsibility for the schools in each state system. Traditionally, each state Ministry controlled the curriculum in its schools. Educational debate during the late 1960's, resulted in the beginning of a gradual devolution of authority for decision-making to the school level. This was enhanced in 1972 by a change in the government of Australia, when the new federal government began to implement its educational policies and began to take a role in school level education (McKinnon, 1988). By the mid 1970's, school-based curriculum development (SBCD) was a major issue, and a priority for support by the federal government through its Curriculum Development Center (Walton,

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1981a). A considerable amount of SBCD occurred in Australian schools, but it was not all successful.

From a summary of perspectives on the progress of SBCD (Walton & Morgan, 1981) it appears that some of the problems related to the perception that SBCD was "more democracy by decree than an upsurge of demand by the schools" (Walton, 1981b, p.286). During the 1980's, another period of educational change resulted in further moves, this time from the state Ministries, to devolve curriculum responsibility to schools (McGaw, Piper, Banks & Evans, 1992). In Western Australia, a series of sweeping changes, particularly in high schools, relating to curriculum (Beazley, 1984), assessment (McGaw, 1984) and administration (Ministry of Education, 1987, 1988) has resulted in schools becoming more self-directing. However, state authorities still retain full control of faculty selection and placement and major control of finance, two critical factors affecting the flexibility of schools attempting to be self-determining.

By the end of the 1980's, other social and political pressures were being felt in education. One of these related to the increasing emphasis being placed on science and technology in the education of Australian students. Unlike science education, long recognized as an important section of the school curriculum, technology education was ill-defined (Black & Harrison, 1985) and had taken its place in the curriculum in different ways (Lewis, 1991; Medway, 1989). In 1988, the Ministry of Education in Western Australia responded to these pressures and invited schools to submit proposals to the Ministry to become 'technology schools'. Schools were to devise a plan for the adaptation of their curriculum to include technology. No specific brief was given to schools, rather they were expected to plan programs which utilized the expertize of their staff, met the needs of their students and were integrated within the context of the school community. The Ministry made available special additional funding to six schools for the implemention of their proposals.

In 1988, two metropolitan and four country schools (two of which were remote), received grants to implement their proposals to introduce technology into their curriculum. Each school planned to implement technology education in a unique way, according to its interpretation of the needs of its clientele and the circumstances of its location, and each identified a faculty member who was to be the program coordinator. The Ministry commissioned an evaluation of the six curriculum innovations in an attempt to identify successful models of implementation which might be transportable to other schools. This paper is based on further analyses of the findings of that evaluation (Treagust & Rennie, 1991). The purpose of this paper is first, to identify the common factors which determined

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the success or failure of the six schools' curriculum innovations and interpret these factors in the context of the administrative relationship between schools and the Ministry of Education, and second, to present guidelines to increase the chance of success of school-initiated curriculum change in a centralized education system.

Method

Design of the evaluation

The design of the evaluation was a multi-site case study (Merriam, 1988). The broad perspective taken for the evaluation followed the approach suggested by Stake (1967), in that judgements about the success or failure of each school's implementation of its technology innovation were based on the congruence between the intents of the program and what eventually occurred. Thus the effectiveness of the innovation was judged in terms of (i) the intended curriculum, which was defined by the way technology was presented by written statements of policy, the syllabi and teaching materials; (ii) the implemented curriculum, which was defined by observations of the way technology was actually incorporated into the curriculum; and (iii) the achieved curriculum, defined in terms of the degree of match between the intended and implemented curriculum.

The evaluation focused particularly on description of the schools' programs, and examined the context (antecedents) and process (transactions) in each program, rather than students' outcomes, an approach which recognized that outcomes rarely guide change (Stake, 1991). It also took cognizance of the gradual adjustments school faculty made on the basis of their experiences as their implementation progressed, thus priorities and curriculum goals changed in response to what was happening in the school and its community.

The schools

The characteristics of the six schools are described briefly in the first column of Table 1. Schools varied from large metropolitan high schools to small district high schools with a large proportion of indigenous Aboriginal students. The location of the schools is an important factor. In WA, the Ministry of Education selects and assigns faculty to all of its schools. Metropolitan and coastal schools are considered to be desirable locations because of the climate and accessibility of facilities. Remote and inland schools are less popular choices. The consequences of this are that, apart from teachers in promotional positions, the faculty are mostly young and often in their first years of teaching, and there is a large faculty turnover, often as much as 50% at the end of each school year. This is the situation in the two technology schools which were most distant from Perth.

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Table 1. Features of the Six Technology Schools

School	Focus of Innovation	Allocation of Funds	Outcomes
East Metro High Perth metropolitan area, culturally diverse population 700 students (Grade 8-12) Low faculty turnover	Whole-school approach to the development of appropriate technological skills.	Faculty release (91%) Resources (6%) Equipment (2%) Travel (1%)	Intended curriculum achieved. Technology "ethos" in school shared by nearly all faculty.
South Metro High Perth metropolitan area, 1400 students (Grade 8-12) Low faculty turnover	Integration of technology in some subjects as a way of thinking and as a means to changing teaching methods.	Faculty release (90%) Resources (5%) Equipment (1%) Travel (4%)	Intended curriculum has been achieved in some subject departments. Technology "ethos" in schools shared by most faculty.
Rural High Major agricultural town, 100 miles from Perth, 800 students (Grade 8-12) Low faculty turnover	A variety of separate projects to enhance technology literacy across all subject areas.	Faculty release (15%) Resources (20%) Equipment (54%) Travel (11%)	Technology focus visible in some subjects. Most projects achieved, but delays with equipment operation.
Country High Major inland mining town, 400 miles from Perth, 1000 students (Grade 8-12) High faculty turnover	New units in several subjects based on local issues.	Faculty release (22%) Resources (5%) Equipment (32%) Travel (41%)	Some projects achieved. Lack of awareness of technology by new staff.
Remote District High Small town, 1800 miles from Perth, 200 students (Grade 1-10) Very high faculty turnover	Five separate projects integrating technology in different subjects. Computers introduced to all students.	Faculty release (11%) Equipment (71%) Travel (18%)	One of five projects achieved. Equipment not used.
Central District High Small farming town 150 miles from Perth, 200 students (Grade 1-10) Moderate faculty turnover	Whole school approach using computer applications. Community links associated with computing	Faculty release (29%) Resources (12%) Equipment (49%) Travel (10%)	Initial success, but program now halted. Equipment not used to capacity.

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Data Collection

Data collection took place in two stages. Schools received funding for their proposals during the 1988 school year for the implementation of their technology programs during 1989. The first data collection period was at the end of the 1989 school year and the second at the end of the 1990 school year to examine the extent to which the programs had continued. Each school was visited during 1991 to facilitate the interpretation of the data and to interview participants.

Data were collected by three methods: the analysis of documents provided by schools; questionnaires to the technology coordinators (at the end of 1989 and 1990) and teachers (at the end of 1990); and interviews with coordinators, teachers and students (1990). An interim report was prepared at the end of 1989 and the findings used to structure the second data collection so as to make effective provision for each school's unique program, and the way the program developed as the implementation progressed. The data collection is described fully in the final report of the evaluation project (Treagust & Rennie, 1991).

Results

Each of the schools chose to implement technology in a different way according to how technology was defined and operationalized in the innovation. Only the general features of the programs are important to this analysis (the specific features are reported by Treagust & Rennie, 1991), because the emphasis is factors which are generalizable across schools. The general focus of each school and the way the funds were used in summarized in the second and third columns in Table 1.

The differences in the implemented curricula related to

(i) whether the school's definition of technology was in terms of technological products, such as computers and computer-based equipment, or in terms of technology as a process of problem-solving,

(ii) the proportions of funds spent on hardware and on faculty release for teacher development/ inservice about technology, and

(iii) the method chosen to coordinate the curriculum change within the school.

The final column of Table 1 briefly summarizes the outcomes of the schools' technology innovations. The first three of the schools listed were judged to have been successful in terms of achieving their intended curriculum and the other three were not. Characteristics of the innovations in successful schools were

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(i) thorough documentation of the planning process and the intended implementation,

(ii) a large proportion of funds spent on teacher inservice education in relation to the program and a smaller allocation of funds for the purchase of hardware,

(iii) effective communication among faculty about the school's program and articulation between old and new faculty about the purpose of the program, and

(iv) a technology coordinator who was released from other duties on at least a part-time basis and thus had adequate time to coordinate the program.

Barriers which prevented effective implementation of the innovations in the three unsuccessful schools were

(i) dependence of the program on one or a very few faculty members,

(ii) dependence on the efficient operation of hardware,

(iii) large faculty turnover at the end of successive years, and

(iv) failure to articulate the continuation of the program between outgoing and incoming faculty.

In each of the three unsuccessful schools, the initial technology coordinator was able to implement the intended activities in the short term, but because these activities were so dependent on him or her, once he or she had left the school, various aspects of the projects were not continued. At Country Senior High School, two technology initiatives remained although there was no coordination between the two subject areas. The teachers involved realized the need to provide some overall coordination, as did the newly appointed Principal in 1990, but no funds were made available to finance such a position within the school. Remote District High had a viable technology initiative which was dependent on one staff member who had been at the school for a number of years. The other projects in this school did not continue because the large faculty turnover prevented any effective communication between outgoing and incoming staff to the school. This was especially noticeable between the initial outgoing Deputy Principal who was the technology coordinator and her successor. Central District High made the decision to officially place the technology project 'on hold' since there was no relevant expertize to operate the comprehensive computer setup for desk-top publishing within the school's present staff.

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Discussion

The findings of the evaluation suggest three factors without which school-based curriculum innovation is unlikely to succeed. These factors have particular significance when the school is part of a centralized system and thus has limited flexibility in decision making about finance and staffing.

Effective coordination

Continuing support is needed for at least one faculty member to have adequate time to maintain an overview of what is happening in the program, to document, reflect upon and evaluate progress, and to ensure that both existing and incoming faculty are aware of the progress and direction of the program in the school. The importance of careful documentation of an innovation, including careful planning for its implementation is not a new idea, it has been long recognized as an essential ingredient of successful educational change (Hall, 1992). What was not recognized by some schools' plans, was the need to have sufficient funds to support the position of coordinator, at least on a part-time basis, for a period beyond the introduction of the new program.

Time

The importance of time was initially under-rated in all schools. Coordinators found that it took much longer than they expected for teachers to understand and develop a sense of ownership for the technology program, it took time to plan changes in syllabus statements and to modify teaching and learning strategies, and it took time to implement those changes and to reflect upon the outcomes. The single issue of time appears to be crucial for the success of a school-based curriculum innovation and it is unrealistic to expect that significant curriculum change can occur in a time as short as the eighteen months during which these schools were funded. A single injection of funds is simply inadequate for a curriculum innovation intended to have a long life.

That effective implementation takes time and money is simply recognition of the fact that curriculum change is not an event, it is a process. Hall (1992) describes how this realization became evident in the 1970's. Well planned curriculum change must make allowance for a period of implementation as well as the period of planning and development. The schools that recognized this were more likely to be successful.

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Faculty stability

The potential for schools to succeed in implementing curriculum change depends on many factors but central to those factors is the degree of control which schools have over the stability of their teaching faculty. Schools in a centralized education system, such as those in this study, do not have control over this factor. In the two remote schools, despite what appeared to be adequate initial planning, the failure of the program could be attributed directly to large faculty turnover at the end of both 1988 and 1989. In another school, new faculty did not have the technical skills to use and maintain the computer equipment that was essential to continue the technology program. Unless steps are taken to ensure that new faculty are orientated to the program and given time to develop a sense of commitment to it, there is little likelihood that the program will persist.

Conclusion

The identification of these factors as prerequisite to success is not surprising. In her analysis of a number of school-based curriculum developments, Soliman (1981) identified the intrinsic motivation of the faculty, the leadership style of the principal, adequate time for the implementation, and continuity of faculty in the school as factors which contributed to the success of the development. The opportunity given to schools in this study for developing their own program of technology education was not realized with equal success, at least partly because control of resources such as funding and staffing remained centralized.

The importance of these factors needs to be heeded by centralized education systems wishing to encourage schools to implement their own curriculum innovations. However, there remain inherent dilemmas for the systems making such decisions. In Western Australia, the schools whose programs were funded and were most successful are those which also are favored by their environment, community facilities and relatively stable faculties. Remote schools, whose environment is harsh in a climatic and geographic sense, and whose communities do not have the same desirable facilities as the more affluent metropolitan schools are those least likely to be successful because of the high staff turnover. Should the Ministry have refused to support the programs of these schools because they were less likely to succeed? Refusal may well have led to accusations of bias against schools already disadvantaged by their location. In recognition of their disadvantage, should the Ministry give extra funding to buffer the high staff turnover? Or would this be detrimental to other schools wishing to secure funds for their programs? Recognition of all of these issues is essential before decisions

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are made. Perhaps the most important role of the Ministry is to counsel schools' would-be innovators on the basis of the findings of studies such as this one and ensure that schools make adequate planning for those factors which are likely to promote success.

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